# TFT LCD Approval Specification

# MODEL NO.:M156B1-C01

Customer : _____

Approved by : _____

Note :

| 核准時間 | 部門 | 審核 | 角色 | 投票 |
|---|---|---|---|---|
| 2009-08-11 17:49:41 | **MTR** 產品管理處 | 吳 2009.08.11 柏 勳 | Director | Accept |

**Version 2.0**

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REVISION HISTORY

| Version | Date | Section | Description |
|---------|------|---------|-------------|
| Ver. 2.0 | Jul, 16 '09 | - | M156B1-C01 approval specifications was first issued. |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

The M156B1-C01 is a 15.6-inch wide LCD cell with thin film transistors as active elements and contains 1366x768 pixels. Each pixel is divided into red, green and blue dot, which are arranged in vertical stripe. The cell is normally white mode, and can be applied to the transmission type display. Backlight unit (BLU) and circuit board for the cell are not built in.

## 1.2 FEATURES

- Response time 8ms
- WXGA (1366 x 768 pixels) resolution

## 1.3 APPLICATION

- TFT LCD Monitor
- TFT LCD TV

## 1.4 GENERAL SPECIFICATIONS

| Item | | Specification | Unit |
|---|---|---|---|
| Max Panel Dimension (TFT) | | 353.632 X 203.086 | mm |
| Glass thickness( TFT/ CF ) | | 0.7/0.7 | mm |
| Active Area | | 344.232 (H) x 193.536 (V) (15.6" diagonal) | mm |
| Driver Element | | a-si TFT active matrix | - |
| Pixel Number | | 1366X R.G.B X 768 | pixel |
| Pixel Pitch | | 0.252 (H) X 0.252 (V) | mm |
| Pixel Arrangement | | RGB vertical stripe | - |
| Transmissive Mode | | Normally white | - |
| Surface Treatment | | Hard coating (3H), AG (Haze 25%) | - |
| Polarizer Type | | TAC | - |
| Polarizer Dimension | TFT | 350.43 X 199.44 | mm |
| | CF | 350.43 X 199.44 | mm |
| Polarizer Thickness | TFT | 0.215 | mm |
| | CF | 0.215 | mm |
| Weight | | 297(typ.) | g |

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## 2. ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Value | | Unit | Note |
|------|--------|-------|-------|------|------|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | +50 | ºC | (1), (2) |
| LCD Cell Life Time | $L_{CELL}$ | 50,000 | - | Hrs | MTBF based |

**Relative Humidity (%RH)**
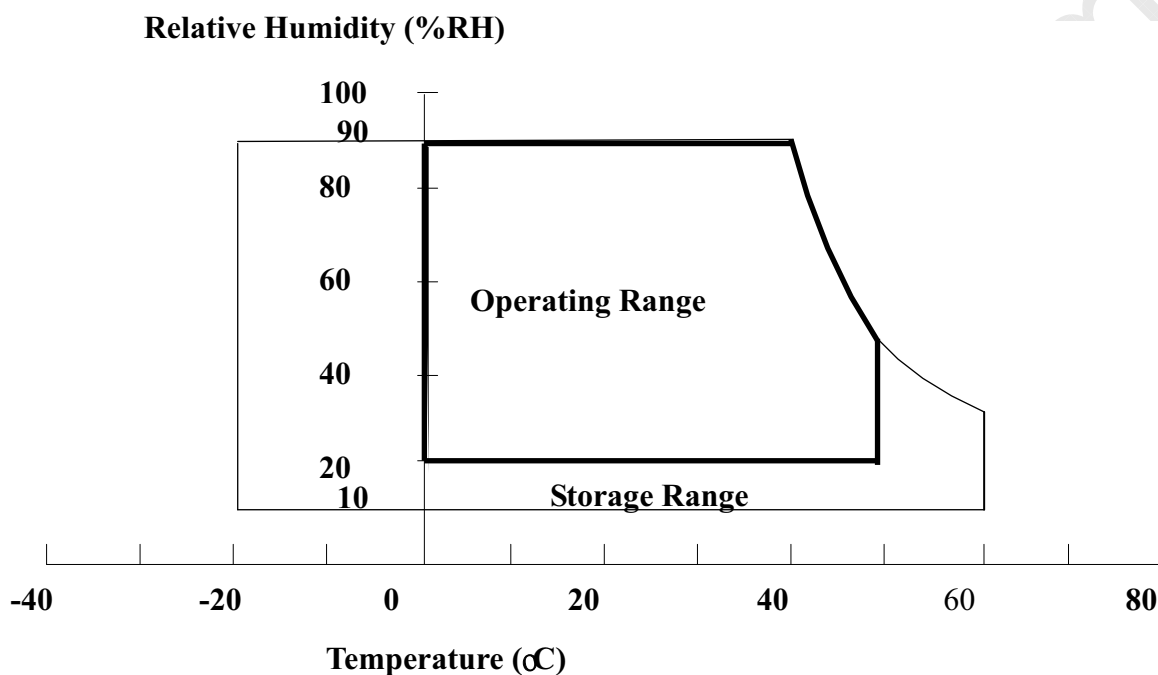


Note (1) Temperature and relative humidity range is shown in the figure below.

        (a) 90% RH Max. (Ta $\leqq$ 40 ºC).

        (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

        (c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC Min. and 60 ºC Max

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## 3. Suggestive Driving Condition

| Item | | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Driving Voltage | V$_G$ | On | 20.13 | 20.83 | 21.53 | V |
| | | Off | -7.46 | -6.86 | -6.26 | V |
| | V$_D$ | B Gam1 | 10.275 | 10.475 | 10.675 | V |
| | | B Gam14 | -0.1 | 0.1 | 0.3 | V |
| | | W Gam7 | 5.717 | 5.917 | 6.117 | V |
| | | W Gam8 | 5.185 | 5.385 | 5.585 | V |
| | V$_{COM}$ | Center | 4.0 | 4.5 | 5.0 | V |
| | G↓-D offset | | 2 | - | - | us |
| | Charging time | | 15 | - | - | us |

B: Black pattern

W: White pattern

Gamma Voltage : Gam1 > Gam2 > Gam3 > … > Gam10 G↓ : gate pulse falling edge

### DRIVING TIMING DIAGRAM

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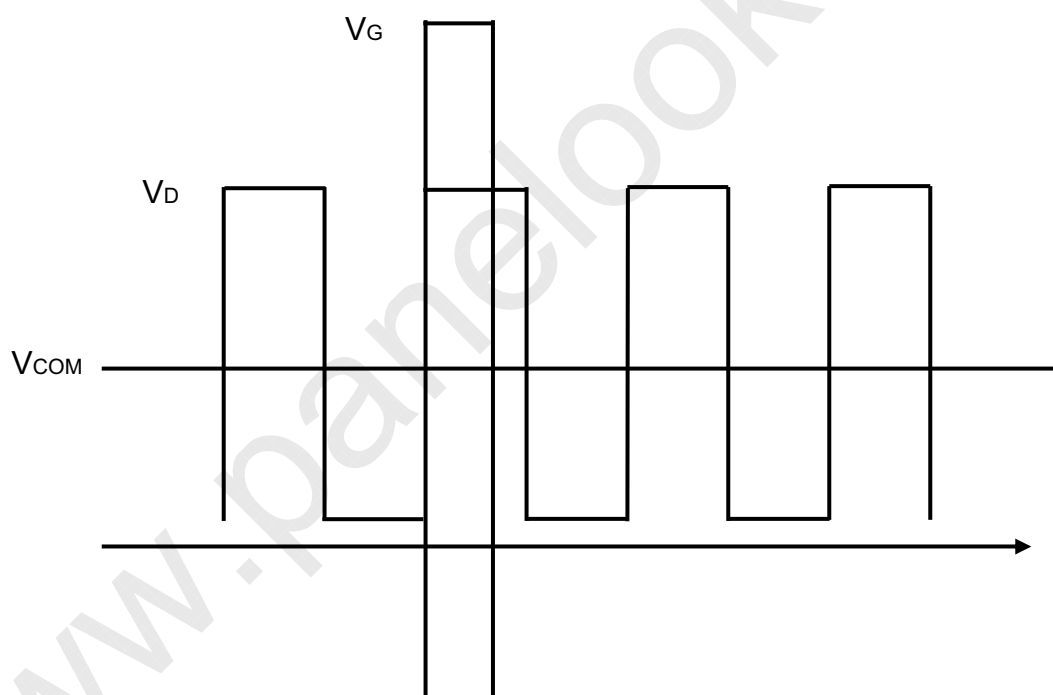
## 4. PANEL PIN DEFINITION

### 4.1 DATA PIN DEFINE

| Pin number | TAB1 | TAB2~5 | TAB6 |
|---|---|---|---|
| 1 | dummy | dummy | dummy |
| 2 | dummy | dummy | dummy |
| 3 | dummy | dummy | dummy |
| 4 | dummy | dummy | dummy |
| 5 | dummy | dummy | dummy |
| 6 | dummy | dummy | dummy |
| 7 | dummy | dummy | dummy |
| 8 | LR | dummy | dummy |
| 9 | XAO | dummy | dummy |
| 10 | OE | dummy | dummy |
| 11 | CPV | dummy | dummy |
| 12 | STV1 | dummy | dummy |
| 13 | STV2 | dummy | dummy |
| 14 | VSS | dummy | dummy |
| 15 | VSS | dummy | dummy |
| 16 | VDD | dummy | dummy |
| 17 | VDD | dummy | dummy |
| 18 | Vee | dummy | dummy |
| 19 | Vgl | dummy | dummy |
| 20 | Vgl | dummy | dummy |
| 21 | Vgl | dummy | dummy |
| 22 | dummy | dummy | dummy |
| 23 | Vgh | dummy | dummy |
| 24 | Vgh | dummy | dummy |
| 25 | Vgh | dummy | dummy |
| 26 | Vcom | Vcom | Vcom |
| 27 | Vst | dummy | dummy |
| 28 | Vst | dummy | dummy |
| 29 | Vcom | Vcom | Vcom |
| 30 | dummy | dummy | dummy |
| 31 | OUT_1 | OUT_1 | OUT_1 |
| 32 | OUT_2 | OUT_2 | OUT_2 |
| 33 | OUT_3 | OUT_3 | OUT_3 |
| 34 | OUT_4 | OUT_4 | OUT_4 |
| 35 | OUT_5 | OUT_5 | OUT_5 |
| 36 | OUT_6 | OUT_6 | OUT_6 |
| 37 | OUT_7 | OUT_7 | OUT_7 |
| 38 | OUT_8 | OUT_8 | OUT_8 |
| 39 | OUT_9 | OUT_9 | OUT_9 |
| .... | | | |
| 372 | OUT_342 | OUT_342 | OUT_342 |
| 373 | dummy | dummy | dummy |
| …. | dummy | dummy | dummy |
| 408 | dummy | dummy | dummy |
| 409 | OUT_343 | OUT_343 | OUT_343 |
| .... | | | |
| 729 | OUT_663 | OUT_663 | OUT_663 |
| 730 | OUT_664 | OUT_664 | OUT_664 |

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| 731 | OUT_665 | OUT_665 | OUT_665 |
|---|---|---|---|
| 732 | OUT_666 | OUT_666 | OUT_666 |
| 733 | OUT_667 | OUT_667 | OUT_667 |
| 734 | OUT_668 | OUT_668 | OUT_668 |
| 735 | OUT_669 | OUT_669 | OUT_669 |
| 736 | OUT_670 | OUT_670 | OUT_670 |
| 737 | OUT_671 | OUT_671 | OUT_671 |
| 738 | OUT_672 | OUT_672 | OUT_672 |
| 739 | OUT_673 | OUT_673 | OUT_673 |
| 740 | OUT_674 | OUT_674 | OUT_674 |
| 741 | OUT_675 | OUT_675 | OUT_675 |
| 742 | OUT_676 | OUT_676 | OUT_676 |
| 743 | OUT_677 | OUT_677 | OUT_677 |
| 744 | OUT_678 | OUT_678 | OUT_678 |
| 745 | OUT_679 | OUT_679 | dummy |
| 746 | OUT_680 | OUT_680 | dummy |
| 747 | OUT_681 | OUT_681 | dummy |
| 748 | OUT_682 | OUT_682 | dummy |
| 749 | OUT_683 | OUT_683 | dummy |
| 750 | OUT_684 | OUT_684 | dummy |
| 751 | dummy | dummy | dummy |
| 752 | dummy | dummy | dummy |
| 753 | Vcom | Vcom | Vcom |
| 754 | dummy | dummy | Vst |
| 755 | dummy | dummy | Vst |
| 756 | dummy | dummy | G_gate(Vgl) |
| 757 | dummy | dummy | G1-Vcom |
| 758 | dummy | dummy | G2-Vcom |
| 759 | dummy | dummy | dummy |
| 760 | dummy | dummy | dummy |
| 761 | Vcom | Vcom | Vcom |
| 762 | Vcom | Vcom | Vcom |
| 763 | dummy | dummy | dummy |
| 764 | dummy | dummy | dummy |
| 765 | dummy | dummy | dummy |
| 766 | dummy | dummy | dummy |
| 767 | dummy | dummy | dummy |

Note: 1. Test pin is recommend for floating

2. LR default value is Vss (ground)

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## 4.2 SCAN PIN DEFINE

| Scan1~3 | DUMMY | OE | CPV | PASS2 | STV2 | VSS | MODE2 | VDD | VEE | VEE | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 155 | 156 | 157 | 157 | 159 | 160 | 161 | 162 | 163 | 164 | | |
| XAO | 154 | | | | | | | | 165 | 166 | VEE | |
| VDD | 153 | | | | | | | | 167 | 168 | VEE | |
| LR | 152 | | | | | | | | 169 | 170 | VGH | |
| TEST | 151 | | | | | | | | 171 | 172 | VGH | |
| | | | | | | | | | 173 | 174 | PASS1 | |
| | | | | | | | | | | 175 | Dummy PAD | |
| DUMMY | 150 | | | | | | | | | 176 | OUT264 | |
| . | | | | | | | | | | 177 | OUT263 | G(1,1) |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | OUT136 | G(1, 128) |
| . | | | | | | | | | | | OUT135 | |
| . | | | | | | | | | | | . | |
| | | | | | | | | | | | OUT129 | |
| | | | | | | | | | | | OUT128 | G(1, 129) |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| . | | | | | | | | | | | . | . |
| DUMMY | 15 | | | | | | | | | 439 | OUT1 | G(1,256) |
| | | | | | | | | | | 440 | OUT0 | |
| | | | | | | | | | | 441 | Dummy PAD | |
| PASS3 | 14 | | | | | | | | 442 | 443 | PASS1 | |
| LR | 13 | | | | | | | | 444 | 445 | VGH | |
| VSS | 12 | | | | | | | | 446 | 447 | VGH | |
| XAO | 11 | | | | | | | | 448 | 449 | VEE | |
| | | | | | | | | | 450 | 451 | VEE | |
| | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | | |
| | DUMMY | OE | CPV | PASS2 | STV1 | VSS | MODE1 | VDD | VEE | VEE | | |

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## 5. OPTICAL CHARACTERISTICS

### 5.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | °C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Gamma voltage | - | Refer to Item 3 driving condition | V |
| Vcom | - | most suitable Vcom | V |

### 5.2 OPTICAL SPECIFICATION

| ITEM | | Symbol | Condition | MIN. | TYP. | MAX. | UNIT | NOTE |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | $\theta_x=0°$, $\theta_Y=0°$ CS-1000T, CMO BLU | 350 | 500 | - | % | 4,1,8 |
| Response Time (Black/White) | | Tr | $\theta x=\theta y=0°$ | - | 2 | 4 | ms | 5,1,8 |
| | | Tf | $\theta x=\theta y=0°$ | - | 6 | 12 | ms | |
| Center point Transmittance | | T% | $\theta_x=0°$, $\theta_Y=0°$ CS-1000T, CMO BLU | 10.5 | 11 | - | % | 7,1,8 |
| Transmittance uniformity (13pts) | | $\delta$ T% | $\theta x=\theta y=0°$ | - | 1.4 | 1.5 | - | 6,1 |
| Viewing Angle | Horizontal θx (θy=0°) | Right | CR≥10 USB2000 | 40 | 45 | - | Deg | 2,3,1,8 |
| | | Left | | 40 | 45 | - | Deg | |
| | Vertical θy (θx=0°) | Up | | 15 | 20 | - | Deg | |
| | | Down | | 40 | 45 | - | Deg | |
| Color Coordinate at center point | Red | Rcx | $\theta_x=0°$, $\theta_Y=0°$ CS-1000T Standard light source "C" | Typ -0.03 | 0.641 | Typ +0.03 | - | 2,0 |
| | | Rcy | | | 0.329 | | - | |
| | Green | Gcx | | | 0.274 | | - | |
| | | Gcy | | | 0.585 | | - | |
| | Blue | Bcx | | | 0.150 | | - | |
| | | Bcy | | | 0.106 | | - | |
| | White | Wcx | | | 0.308 | | - | |
| | | Wcy | | | 0.346 | | - | |

Note (0)

Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following：

1. Measure Module's and BLU's spectrums. White is without signal input and R, G, B are with signal input. BLU is supplied by CMO. **Light source is the BLU with DBEF-D2.**
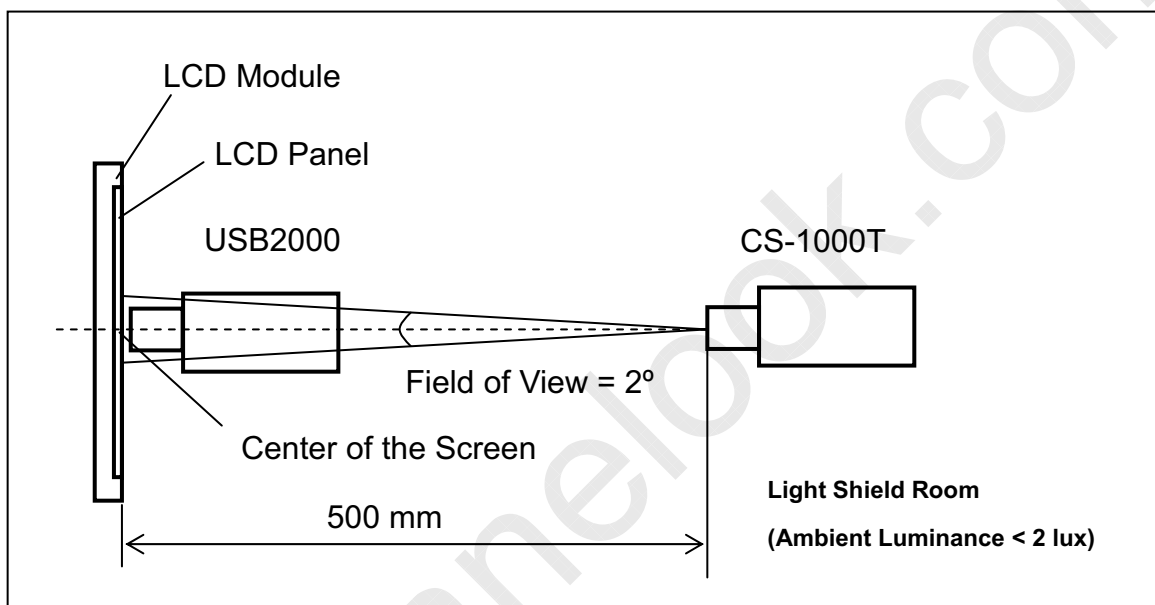
2. Calculate cell's spectrum.

3. Calculate cell's chromaticity by using the spectrum of standard light source "C"
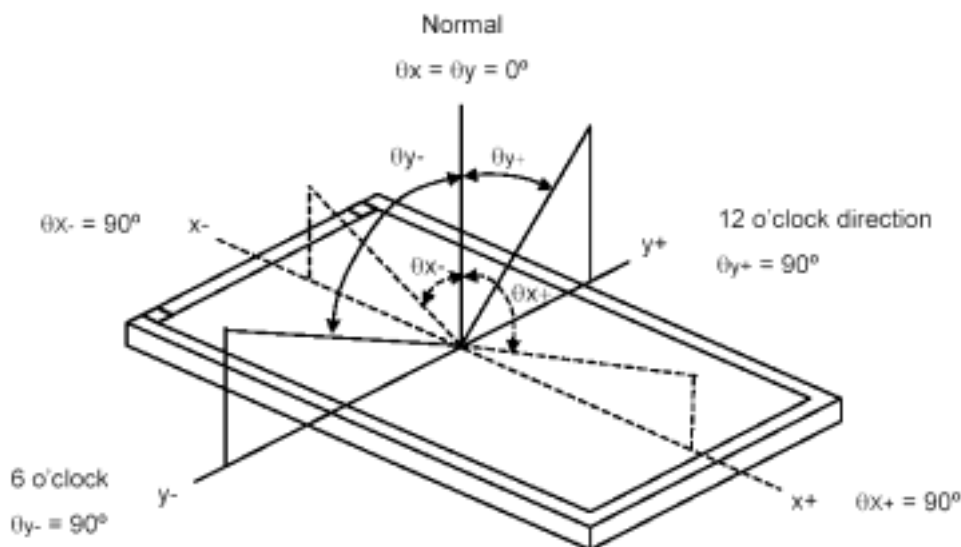
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Note (1)

    Light source is the BLU, which is supplied by CMO, and driving voltages are based on suitable gamma voltages. White is without signal input and R, G, B are with signal input. SPEC is judged by CMO's golden sample.

Note (2): Measurement setup:

    The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes in a windless room.

LCD Module

LCD Panel

USB2000                                    CS-1000T

Field of View = 2º

Center of the Screen

500 mm

**Light Shield Room**

**(Ambient Luminance < 2 lux)**

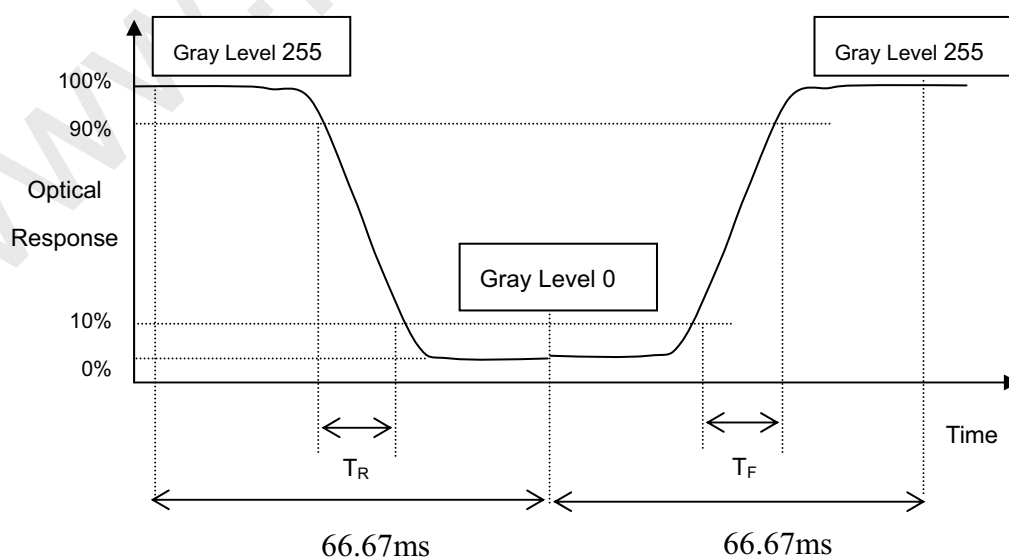Note (3): Definition of viewing angle (θx ,θy):



Note (4): Definition of Contrast Ratio (CR):

Ratio of gray max (Gmax), gray min (Gmin), at the center point of panel.

$$CR = \frac{\text{Luminance with all pixel white (Gmax)}}{\text{Luminance with all pixel Black (Gmin)}}$$
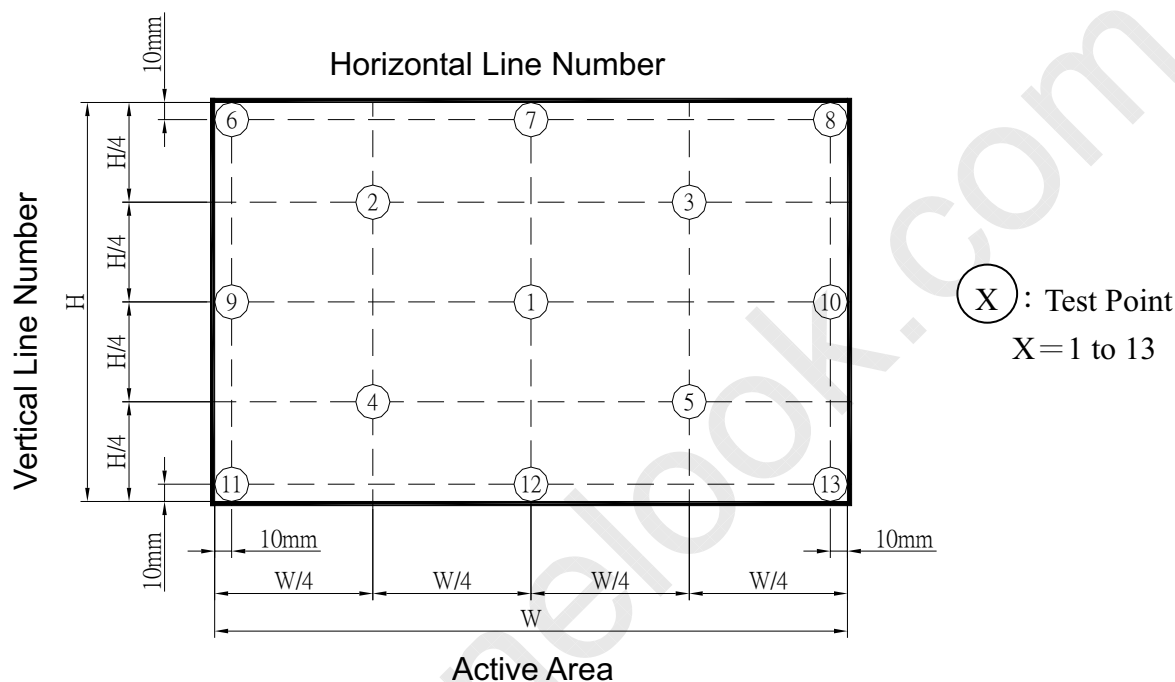
Note (5): Definition of Response Time ($T_R$, $T_F$):



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Note (6): Definition of Transmittance Variation (δT%):

Measure the transmittance at 13 points

$$\delta\,T\% = \frac{\text{Maximum } [T\%(1), T\%(2), \ldots T\%(13)]}{\text{Minimum } [T\%(1), T\%(2), \ldots T\%(13)]}$$



Horizontal Line Number

Vertical Line Number

$\left(X\right)$ : Test Point

X＝1 to 13

Active Area

Note (7) : Definition of Transmittance(T%):

Module is without signal input.

BLU is supplied by CMO .

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} \ast\ 100\%$$

Note (8): Under suggestive driving condition (see Section 3).

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## 6. PACKAGING

### 6.1. PACKING SPECIFICATION

1. 22 pcs LCD panel / 1 Dense Pack Box

2. Dense Box Dimensions: 462 (L) X 273.5 (W) X 119.5(H) mm

3. Weight: Approximately 15.5Kg (44 cells per bag)
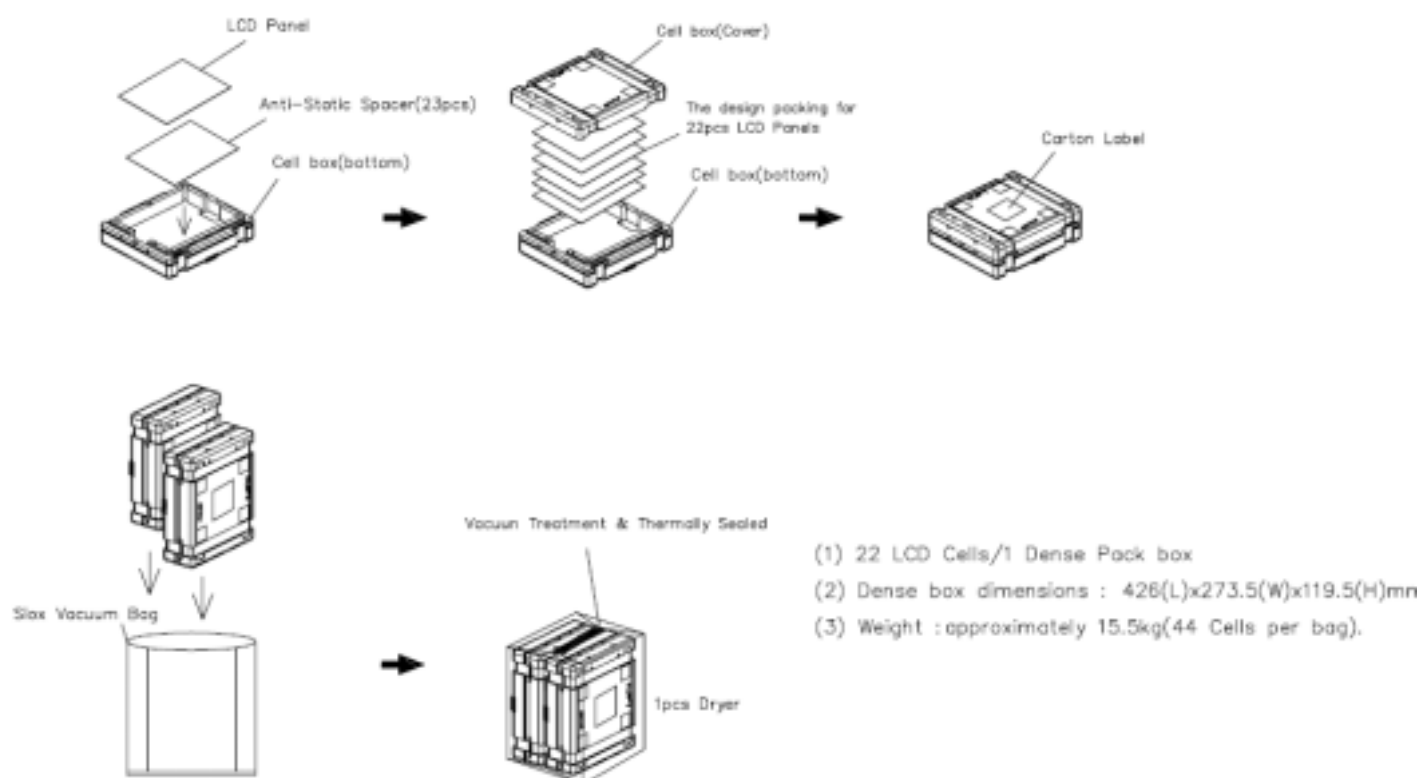
### 6.2 PACKING METHOD



Figure. 6-1 Packing method

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Pallet Stack:L1100*W970*H1423mm

Weight: 750kg
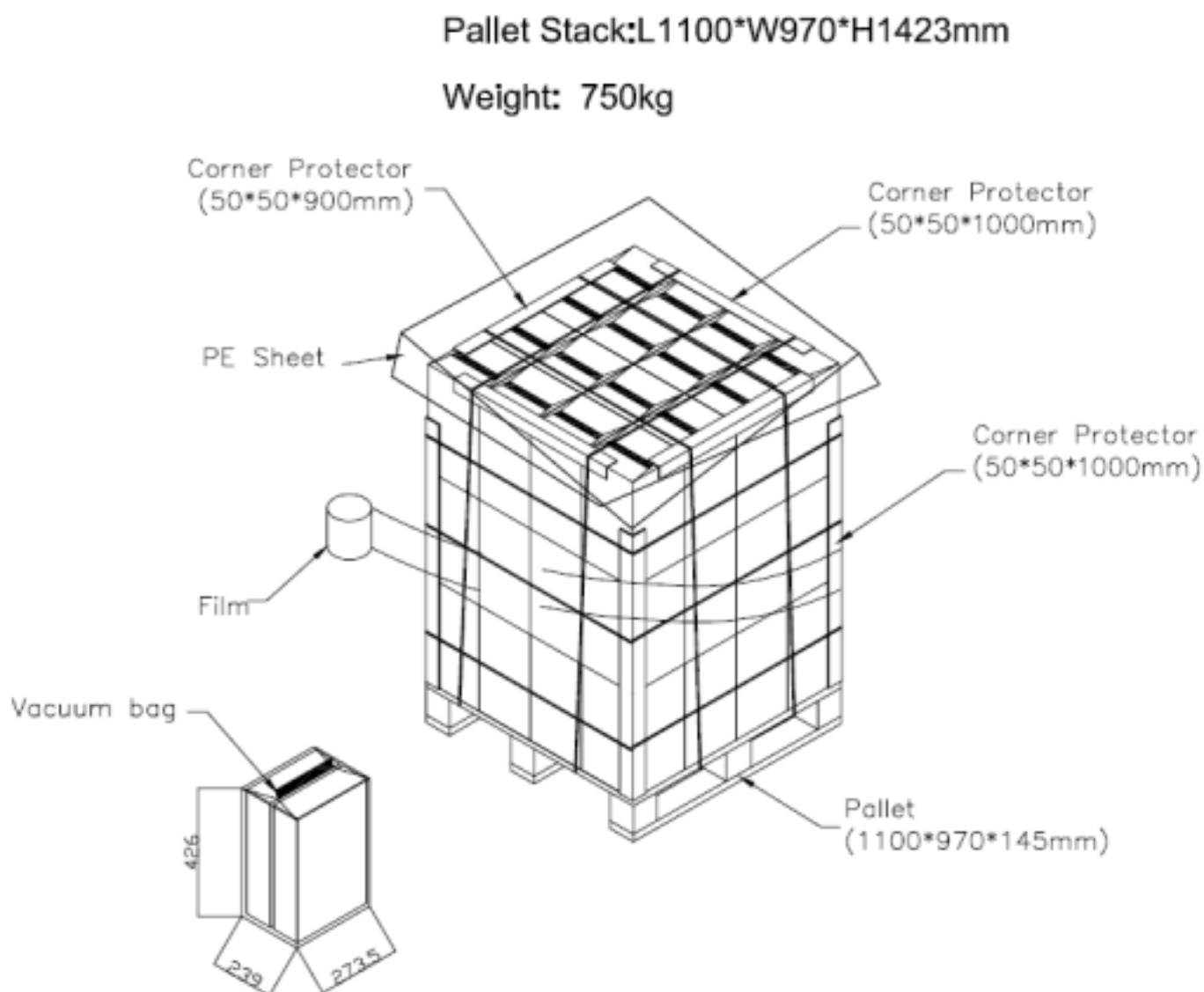


Figure. 6-2 Packing method

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## 7. DEFINITION OF LABEL

1. Mode Name: M156B1- C01

2. Panel Type: version control

3. Quantity: 22pcs / PP box

4. Case ID: serial number.

5. Note: Notification, if necessary.

6. Barcode: Case ID in code39 format

| Model Name | M156B1-C01 |
|---|---|
| Panel Type | 15WX01 |
| Quantity | 22 |
| Case ID | D5F6WX019601049 |
| Note | DF6117NR |
| Note1 | |
| | |
| | |
| | |
| | |

D5F6WX019601049

CHI MEI OPTELECTRONICS CORPORATION

Figure. 7-1 Carton Label

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## 8. PRECAUTIONS

### 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

1. Do not apply rough force such as bending or twisting to the cell during assembly.

2. To assemble or install cell into customer's module can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

3. It is not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

4. Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

5. It is dangerous that moisture come into or contacted the LCD panel, because moisture may damage TFT circuit.

6. High temperature or humidity may reduce the performance of cell. Please store LCD cell within the specified storage conditions.

### 8.2 SAFETY PRECAUTIONS

1. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

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## 9. RELIABILITY TEST

Environment test conditions are listed as following table.

| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias (THB) | Ta= 50℃ , 80%RH, 240hours | (1) |
| High Temperature Operation (HTO) | Ta= 50℃ , 50%RH , 240hours | |
| Low Temperature Operation (LTO) | Ta= 0℃ , 240hours | |
| High Temperature Storage (HTS) | Ta= 60℃ , 240hours | |
| Low Temperature Storage (LTS) | Ta= -20℃ , 240hours | |
| Packing Vibration | 1.14Grms<br>Random, Frequency Range: 1 – 200 Hz<br>Top & Bottom: 30 minutes (+Z), 10 min (-Z)<br>Right & Left: 10 minutes (X)<br>Back & Forth 10 minutes (Y) | (2) |
| Thermal Shock Test (TST) | -20℃/30min , 60℃ / 30min , 100 cycles | (1) |

Note (1) The tests are done with CMO LCD modules (M156B1-L01).

Note (2) The test is done with a package shown in Section 6.

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DETAIL G
SCALE 40:1

□0.3
0.75

DETAIL G
SCALE 40:1

SEE DETAIL G

CF GLASS
P0.052*(767-1)= 39.832
W=0.031

2-0.284

0.2 +0.10/-0.15

*0.05 (MIN)
30°
(0.75)
30°
0.17 ±0.1
(0.8)

SCALE 10:1

0.4
30°
2.4
2(DLB)
0.25 ±0.1
30°
0.17 ±0.1

1.35
9.46
1.63
DETAIL F

DETAIL F

0.2 +0.10/-0.15

203.086 ±0.1 (TFT GLASS)
200.536 ±0.1 (CF GLASS)
199.44 ±0.2 (POLARIZER CF)
199.44 ±0.2 (POLARIZER TFT)

3.5 (BM)
96.8
3.55 (TFT BM)
3.5 (CF BM)

3.65 (CF BM)
3.7 (TFT BM)

58.968
58.968
58.968
58.968
58.968
62
31.388

350.43 ±0.25 (POLARIZER CF)
350.43 ±0.25 (POLARIZER TFT)
345.632 ±0.01 (ASSIST MARK)

SEE DETAIL F

Active Area 344.232X193.536

SEE DETAIL D

172.1

0.126

SEE DETAIL A

SEE DETAIL H

3.7 (BM)

37.382
64.512
64.512

189.586 ±0.01 (ASSIST MARK)
201.086 ±0.01 (MARK)

SEE DETAIL C

POLARIZER CF
POLARIZER TFT

DETAIL A
SCALE 16:1

0.5
0.75
0.7
0.7
3

DETAIL H
SCALE 4:1

SEE DETAIL E

0.96
0.226
0.35
5.487 (CDG Align Mark)
10.974
12.012
23.78
0.908

DETAIL D
SCALE 4:1